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RESEARCH REPORT

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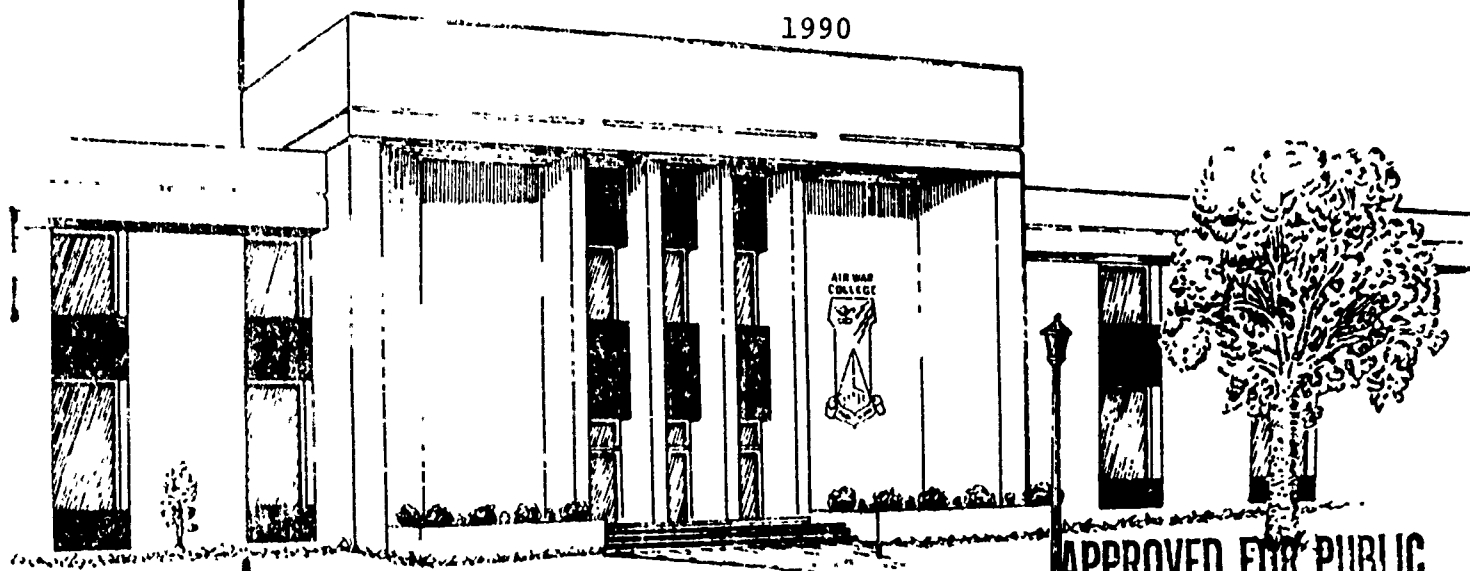
AN INDONESIAN SURVEILLANCE AND SECURITY SYSTEM

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INDONESIAN AIR FORCE

1990



AIR UNIVERSITY
UNITED STATES AIR FORCE
MAXWELL AIR FORCE BASE, ALABAMA

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AIR UNIVERSITY

AN INDONESIAN
SURVEILLANCE AND SECURITY SYSTEM

BY

COLONEL EKO BUDIONO P.

INDONESIAN AIR FORCE

A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY ,
IN
FULFILLMENT OF THE CURRICULUM
REQUIREMENT

RESEARCH ADVISOR: COLONEL DAVID G. KIMBALL

MAXWELL AIR FORCE BASE, ALABAMA

APRIL 1990

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EXECUTIVE SUMMARY

TITLE: An Indonesian Surveillance and Security System

AUTHOR: Colonel Eko Budiono P., Indonesian Air Force.

There are many changes in the world today which in turn will affect the regional balance of power: politically, economically, and militarily.

However, communism as an ideology is still the driving force for the Soviet Union and Cina. A strategy to respond to communist threats in Southeast Asia has been complicated by a communist regime in Vietnam.

Whatever strategy is adopted to respond to threats in Southeast Asia, there will be an escalation of activities, especially in the maritime sphere. Today Indonesian maritime patrol aircraft and detection instrument, even in conjunction with the other ASEAN countries, are not sufficient enough to cope with this hostile threat.

△ This study ^{examines} ~~exams~~ the requirements that ^a surveillance and control system must meet to provide security for Indonesian air and sea space and proposes a system and development program.

It is also examines what part US security assistance could play in establishing this system. Keywords: Indonesia, Systems management, Surveillance, Navy, Air Force, Southeast Asia, United States, Military assistance, Philippines, Theses. (RWJ) ✓

BIOGRAPHY SKETCH

Colonel Eko Budiono graduated from the Indonesian Air Force Academy in 1965. His first assignment was as a Transport Pilot at 17th Squadron, a VIP Squadron at Halim Air Force Base, Jakarta. He later commanded this Squadron from 1980 to 1983. His next assignment was as Base Operation Officer of Halim Air Force Base, until 1986. His last assignment prior to attending Air War College was Cadet Wing Commander of the Air Force Academy at Adisutjipto Air Force Base, Yogyakarta, prior his departure to the Air War College at Maxwell Air Force Base, April 1989.

The IAF Squadron Officer's School (SEKKAU) was the first school he attended in his career, in 1975. In 1971, he attended the USAF Jungle Survival Training program at Clark Airbase in the Philippines. He completed flight Instructor training after the SOS graduation in the same year. He attended New Zealand's Air Command and Staff College at Auckland in 1981. In 1985 he completed the Indonesian Joint Command and Staff College at Bandung.

He was born in 1941, at Cilacap, Central Jawa. He is married to the former Nancy Louise Polii and they have three children: a son, Brahma 19, and two daughters Savitri 17, and Daivi, 15 years old.

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AN INDONESIAN SURVEILLANCE AND SECURITY SYSTEM

CHAPTER I

INTRODUCTION

This study will examine the architecture of a future Indonesian capability to provide surveillance and control of its sovereign territory, and the contribution that US aid could make to acquire the system. The study approach will be framed from Indonesian perspective and will focus on the ASEAN region for at least two reasons. The first reason is that ASEAN is given top priority in Indonesia's foreign policy. Indonesia's perception of national security is directly linked to its concepts of Southeast Asia as a whole. It is in this context that Indonesia views threats from external forces, particularly the great powers, and problems from Sino-Soviet and Sino-Vietnam relations.

The second reason for the ASEAN focus is that Indonesia's concept of regional security cooperation includes assuring cooperation with its ASEAN neighbors for security of sea lanes. Although there are a great number of other issues related to national and regional security, this study will be limited to

those issues which are most relevant to regional cooperation in developing a surveillance and security system to control the strategic maritime straits.

One hardly needs to quote elaborate statistics to demonstrate the importance of sea lanes of communications on which so many countries depend for trade and the transport of energy and other critical materials. The security of the sea lanes in ASEAN waters is, therefore, of the utmost importance. The possible threats to Southeast Asian sea lanes come from mixture of national, regional and extra regional source. Furthermore, possible threats to security of sea lanes may take a variety of forms. In the case of the Mallaca and Singapore straits, the territorial waters of adjacent states cover the straits. Meanwhile there are other sea lanes and straits in Indonesia's archipelago, such as Makasar and Lombok straits, for which a single nation provides security and freedom of passage.

In view of the importance of these sea lanes of communications and the critical straits, Indonesia needs to develop a conceptual plan for a surveillance and security system to control these important regions. The outcome of such a plan should define operational requirements for both national and multinational capabilities to deter or defeat threats in the future. This study will examine the existing capabilities

in Indonesia and then propose the best course of action to acquire a surveillance and security system that satisfies both national and regional security needs.

CHAPTER II

SOURCES AND FORM OF THREATS

The super powers interests and global strategies and unequal economic distribution in the area are most likely to be the "causa prima" of political instability in the region. This instability will in turn create and escalate the seaborne traffic intensity as of result of rising demand for both military and economic cargos. There are also other reasons such as navigational and geographical conditions that could create an "unsecure condition" in these specific areas but the nature of this threat may not be as big danger as that from political instability.

Navigational and Geographical Conditions. From this first category we may cite particularly the danger of groundings and collisions. These are related to the condition of maritime narrows and the size, speed and number of vessels using the waterways. Unless the coastal states, in conjunction with the external powers concerned, succeed in dealing with the problem of navigational safety, an accident may occur in a critical maritime narrows that impedes traffic and creates crisis. Such dangerous conditions could be created by accidents involving super tankers, submarines or aircraft carriers.

Military Threats. Despite the improvement in relations with the West, the Soviet Union is likely to continue to increase its military presence in the area by using Vietnam as a proxy. Although the Soviet Union has reduced the number of ships and aircraft in Vietnam, as well as the tempo of operations, they retain the capability to employ military force to protect Soviet interests in the region. Whatever the Soviet interest and strategy, her presence would affect the frequency and intensity of the traffic which in turn would endanger the region's security and prosperity.

Sino-Soviet-Vietnam Relations. Until 1975, three communist capitals, Beijing, Moscow, and Hanoi, were united in a seeming bond of fraternal alliance and friendship against perceived neocolonialism and aggression. Since 1970, however, their relationships have virtually reversed; Hanoi and Moscow formed an alliance, Beijing and Hanoi not only broke relations, but clashed in a border conflict, and China and the US established closer ties. ASEAN, for its part, built a loose coalition of states as a counterweight to the Soviet backed Vietnamese domination of Indochina. While Sino-Vietnam relations remain frozen, a new element complicating the communist triangular relationship seems to be emerging as a normalization process has begun between Beijing and Moscow. In this context the Soviet strategic concept is closely linked to her global

interests. Indeed, Soviet strategic doctrine represents a system of scientifically substantiated, officially approved, views on preparation for a victorious conduct of diplomacy and war in defence of the Soviet Union. The fundamental operational objective guiding Soviet strategy is the advancement of Soviet power to assure her security and survival are not threatened. Inherent in this are several corollaries involving objectives that enable Moscow to deal with the rest of the world from a position as a super power and to sustain its role as a global rival of the US. One corollary is to maintain a "relatively" strong military position, to cope with any possible threat from Beijing, and the second, to pursue a policy of peaceful coexistence and expansion of influence and power in the third world.

Beijing's strategic planning responds to Moscow. China espouses adherence to five principles of peaceful coexistence in developing relations with all countries while opposing those who seek to build hegemony. In response to Soviet encircling maneuvers around its frontiers, China developed a counter encirclement strategy aimed at the USSR. In operational terms this consisted of diplomatic maneuvers that balanced the two super powers while China concentrated on establishing itself as a leader of the third world.

Militarily, it seems that China will develop relatively

strong and well equiped armed forces to support her interests and strategy, including a blue water navy which can be projected into the South Pacific.

CHAPTER III

THE FUTURE OF ASEAN

Based upon the international environment in the second half of the 1980s, the coming decade is very likely to differ in many ways from the years before. Certainly, not all of the changes at present are of direct relevance to ASEAN. However, some changes are likely to result in an international environment in which fierce competition will prevail, be it political, economic or military in nature. Accordingly, ASEAN is challenged to formulate an appropriate response in order to maintain political stability and continue their relatively rapid economic development. This is needed because both the Soviet Union and China have embarked on a new development policy, leaning strongly toward the market mechanism, although they differ in the extent to which they adhere to the new policy.

The members of ASEAN have expressed a desire to establish a regional order in Southeast Asia which is expressed in the concept, or ideal, of a Zone of Peace, Friendship and Neutrality (ZOPFAN). In essence, it is a concept in which Southeast Asians themselves are capable providing their own security and determining their own future. The idea implies a

structured relationship among the Southeast Asian countries, as well as their collective relations with countries outside the region, and with the superpowers in particular. However, the realization of this ideal rests primarily on the successful development of the national and regional resilience of the Southeast Asian countries. The objective will be to build cooperation and prevent conflict among neighboring countries. The establishment of ASEAN has greatly enhanced mutual trust, understanding, and mutual assistance among its member countries. This contributes to their ability to manage future crises situations that might emerge. Potential examples might be border problem between Malaysia and Thailand, or Malaysia and Indonesia.

LOW INTENSITY CONFLICT

Another threat to Southeast Asia which must be considered is internal or domestic conflict especially in Indonesia, the Phillipines, and Cambodia. Although the nature of low-intensity conflict in each of these countries is unique and unrelated, the source of the conflict is still the same: it is "communism". United States interests in low-intensity conflict and the outcome is also different in each case. But that is not to say that US response to one conflict will not be without effect on others.

In Indonesia, under the leadership of President Suharto,

the Indonesian Communist Party (PKI) was destroyed during an abortive coup attempted in 1965. Since then the PKI has been banned because it was the most dangerous and the largest communist revolutionary movement in East Asia. Subsequently the government stabilized and gradually modernized the country in one of the most astonishing turn-arounds in the Third World. But the danger of communism remains and is based on their revolutionary doctrine and strategy. American policy towards Indonesia has consistently taken a geopolitical stance, with the exception of some human rights pressures during the Carter administration. Indonesia's record of stability and development the past 25 years has been an anchor for ASEAN, and ASEAN's progress should be considered as a positive contribution to US interests in the region.

The Philippines figures even more prominently and directly in United States interests in Southeast Asia. The two countries have a special relationship, and the US military power in the region, projected in part on behalf of ASEAN, depends on two critically located (and nonreplaceable) Philippine military installations: the Subic Bay naval complex and Clark Air Base. American military operations out of these Philippine bases underwrite the strategic balance in Southeast Asia, a balance which wavered dangerously following the Indochina war in the mid-1970s.

Now a very different transition and challenge is underway in the Philippines, one in which the United States is supporting the building of a democratic polity by a nonauthoritarian regime attempting to pull the country out of years of socioeconomic malaise. The key to American policy in support of Philippine's effort to quell its low intensity conflict lies in broader kinds of policy support. The insurgent challenge in the Philippines is a symptom, not the cause.

The war in Cambodia, while perhaps of less significance to the United States than events in the Philippines and Indonesia, impacts US interests because so many countries, both friendly and adversary, are involved. Wherever the Soviets are in East Asia, the United States automatically must be alert. And when a treaty ally, like Thailand, has its security threatened, it concerns the United States. Neutralization of Cambodia would have the advantage of converting the violent contest into an economic and political contest. Whichever policy track the US adopts in the future, it is clear that the conflict in this area is the product of complex multilateral forces .

According to Professor Sam Sarkesian's spectrum of conflict, there is a range of relative likelihood for a particular level of conflict or warfare to be reached. (1:15) The range is from the lowest level of conflict to the ultimate as a high intensity and full scale nuclear conflict. The level

of conflict is usually unpredictable and without any significant and clear symptoms for a change from one level to the other. Recent events, such as arms control developments and Mr. Gorbachev's policies of Glastnost and Perestroika, do not mean that the Soviet Union is necessarily committed to a more peaceful world environment. The probability that low intensity conflict will seriously affect the Southeast Asian countries grows more and more imminent with each passing day. In turn this will also affect the US interests in the area.

Based on the unequal economic distribution and wealth in the area, and the premise of an increased probability of low intensity war in Southeast Asia, there needs to be a greater emphasis placed on containing threats imposed by whatever types of hostility or conflict. These include:

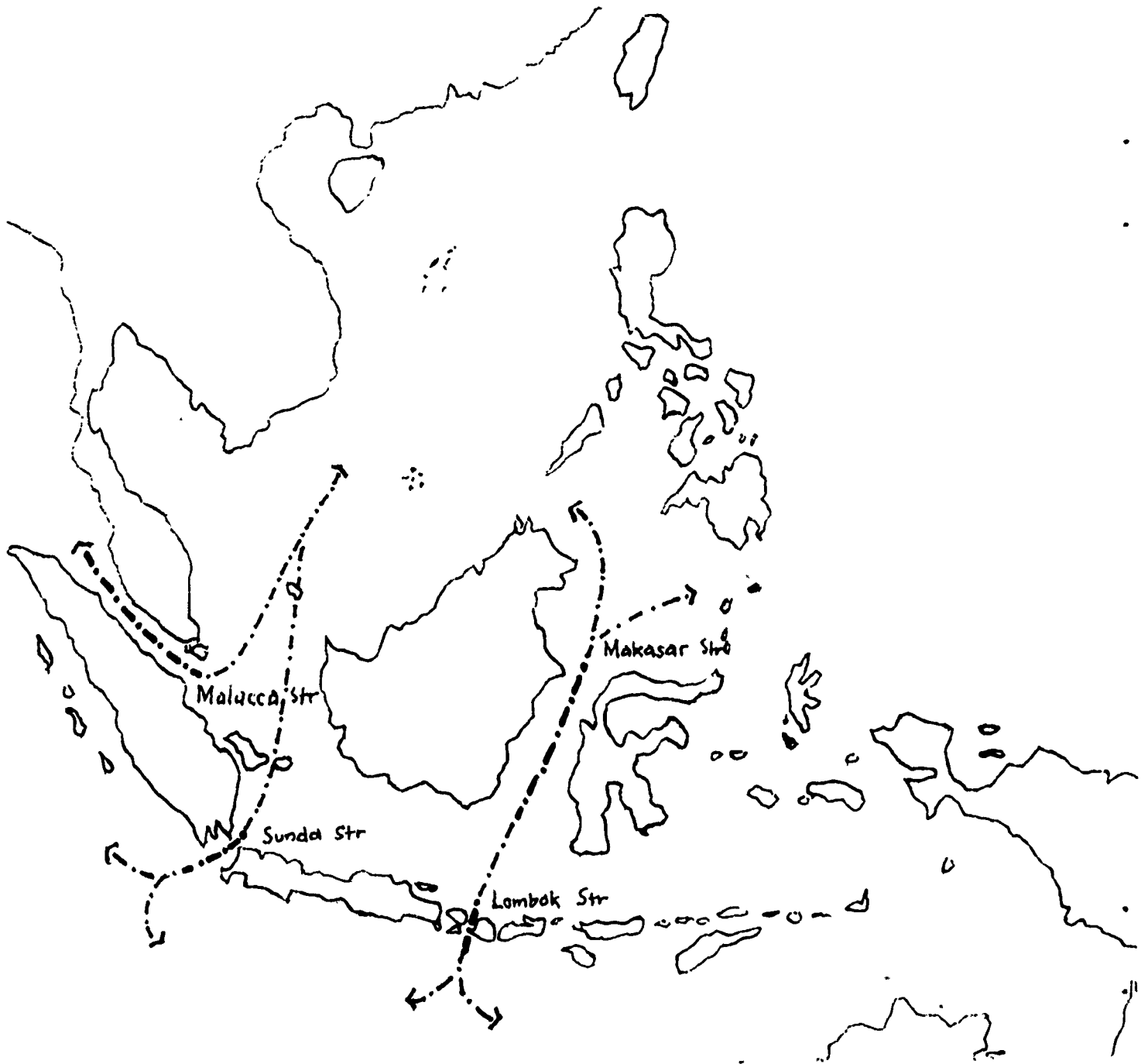
- a. Infiltration
- b. Subversion
- c. Border violation
- d. Smuggling
- e. Other activities.

Therefore Indonesia needs to place greater effort into improving its performance and capability to cope with this type of "limited war" around its periphery and internally. The design and structure of this capability could be an independent Indonesian system, or part of a system based upon broader ASEAN

interests. This could focus on the three nations of Indonesia, Singapore and Malaysia as part of a security system for the Mallaca Straits. Alternatively, it could be part of a broader arrangement, if extra-regional interests in the economic and military importance of critical sea lines of communication (SLOC) are considered.

Figure 1 shows these critical SLOCs. The remainder of this study examines alternative proposals to provide security for these SLOCs and for Indonesia's territorial land, air and sea space as well.

Figure 1



CHAPTER VI

THE INDONESIAN AIR/MARITIME SURVEILLANCE AND SECURITY SYSTEM TODAY

Based on Indonesia's national policy and interests, and also derived from the National Defense and Security Policy and Strategy, the Indonesian Air Force developed programs and strategy based on basic ideas and perception about the internal and external environment. The criterion and consideration for these programs must align with accepted concepts and consensus. These include an archipelago concept, an exclusive economic zone, and a national strategy.

An Archipelago Concept. As the name indicates, this concept comes from the fact that Indonesia is an archipelago. It is a string of islands along the equator from Irian Jaya (West Irian) to the Sumatra islands. These islands are inhabited by some hundred separate groups of people with different ethnic and cultural origins and beliefs. From this diversity, after a long and difficult historic struggle, came a unity which is presently Indonesia. The Indonesians believe that the process should be continued and defended as a political, economic, and sociocultural entity. (2:7)

An Exclusive Economic Zone (EEZ). An extension of the

archipelago concept is the EEZ policy. It extends Indonesian sovereignty over the natural resources found within the zone that should be defended as part of Indonesia. However, the definition of Indonesia's EEZ is still being developed in term of border agreements with the neighboring ASEAN countries such as Australia and Papua New Guinea. In 1990, for instance, a general agreement signed on resources exploration in the border area between Indonesia and Australia. But the South China Sea promises to be a very difficult regional problem to resolve. About nine countries surrounding the area make claims on islands which have high strategic value, even for the major powers. (2:8)

Strategy. Based on the above analysis of factors the principle threat to Indonesia against which a future surveillance and control system should be focused is "territorial violation" in its various forms. Also, in line with the strategy of the "People's Defense and Security System" of the Indonesian Armed Forces, the objective of the "National Air Defense And Security" is to develop a relatively modest "ready and effective Air Force with sufficient reserve", to perform its mission:

- a. To secure freedom and sovereignty
- b. To secure command and control of the air
- c. To protect the vital and strategic areas

d. To maintain stability and cooperation in the area which in turn would increase the national and regional resilience as well.

Consequently, the Indonesian Air Force should align its development program with the national strategy and give specific consideration to the objectives of Indonesian national power. The most important considerations for the Air Force can be summarize as:

- a. To increase its Maritime Air Patrol capability
- b. To increase its Air Defense Capability
- c. To increase its Airlift Capability
- d. To increase its Tactical Air Capability. (2:9)

Although this study will focus on the Maritime Patrol and Air Defense capabilities, bear in mind that the other elements of war fighting capabilities are also required.

The present air/maritime surveillance and security system basically depends on one reconnaissance squadron, No 5, equipped with Boeing 737 and UF-1/UF-2 aircraft. Additionally, the Indonesian Navy has a modest naval air capability. No 5 Squadron is a subordinate of one of the two Air Force Operational Commands: Air Force Operations Command II (AFOCOM II). AFOCOM II is directly under the Commander in Chief of the Armed Forces for the conduct of operational missions. The missions of AFOCOM II Commander are to develop and maintain

operational readiness of all the Air Force combat units under his command; to conduct air operations in his area of responsibility; and to conduct air surveillance and air reconnaissance throughout the country, including the Exclusive Economic Zone.

It is currently beyond the capability of the Air Force, even in joint operations with naval maritime surveillance assets, to provide adequate maritime surveillance and reconnaissance. The only detection capability on the aircraft is Side Looking Airborne Maritime Radar (SLAMMR) with a coverage area about 100 NM at a flight level of 25,000 feet. However at this altitude it is difficult to positively identifying vessels or other object detected on the radar. The total area that should be covered by surveillance is about 3200 by 1100 nautical miles in size, or 3,520,000 square miles. This is a difficult mission for the Air Force and the Navy to accomplish under such condition describe earlier. Figure 2 and 3 shows the current capability to provide differing levels of surveillance using three possessed 737 airplanes with SLAMMR. This does not provide an adequate level of surveillance. The problem is even further complicated if we add a mission to respond to a submarine threat. (3:185)

These problems are not cited to dramatize or exaggerate the weakness and adverse conditions of the Indonesian

circumstances, but to help define the requirement to develop a

Figure 2

Designation of Area Coverages

CLASS 0 AREAS—NO AIRCRAFT PATROL COVERAGE REQUIRED:

- NO FISHING OF CONSEQUENCE
- NO SMUGGLING PROBLEMS
- NO ILLEGAL ENTRY PROBLEMS
- CHARACTERIZED BY EXTREMELY DEEP WATER BORDERING OPEN OCEAN

CLASS 1 AREAS—ONE AIRCRAFT PATROL PER WEEK REQUIRED:

- SECONDARY FISHING AREAS
- NO SMUGGLING PROBLEMS
- NO ILLEGAL ENTRY PROBLEMS

CLASS 2 AREAS—TWO AIRCRAFT PATROLS PER WEEK REQUIRED:

- PRIMARY FISHING AREAS
- NO SMUGGLING PROBLEMS
- NO ILLEGAL ENTRY PROBLEMS

CLASS 3 AREAS—THREE AIRCRAFT PATROLS PER WEEK REQUIRED:

- PRIMARY FISHING AREAS WITH
- SMUGGLING PROBLEMS AND/OR
- ILLEGAL ENTRY PROBLEMS

Figure 3

737 Indonesian EEZ Coverage

| WEEKLY COVERAGE RATE | TOTAL FLIGHT DISTANCE (NMI) | TOTAL FLIGHT TIME (HOURS) | AREA COVERAGE (SQ NMI) | | | |
|----------------------------|-----------------------------------|------------------------------|------------------------|---------|---------|---------|
| | | | CLASS 0 | CLASS 1 | | |
| 3 TIMES | 13,050 | 33.69 | - | 12,800 | - | 404,950 |
| TWICE | 9,870 | 25.50 | 8,320 | 278,855 | 568,770 | - |
| ONCE | 3,300 | 8.79 | 33,210 | 402,615 | 3,710 | 705 |
| ZERO | - | - | 113,110 | 4,800 | 3,520 | 7,745 |
| TOTALS | 26,220 | 67.98 | 154,640 | 699,070 | 576,000 | 413,400 |



"sufficient" and relatively "safe" environment that will support the government's development program. The Indonesian Armed Forces (ARMFOR) have established a joint operations doctrine for the surveillance and security missions. The Air Force, including the Air Defense Command (ADC) and the Navy, then elaborate and break the doctrine down to Standing Operating Procedures (SOP) at squadron level. Unfortunately, the current operational capabilities do not provide the minimum requirement to meet the security objective. Both commands, AFocom and ADC, have developed their functional elements and capability to detect, identify, intercept, control or destroy, to the maximum degree possible based on the equipment available in the system. There are still border violations, unconfirmed natural resources exploration by foreign countries, and even drug smuggling and piracy operations in the area. The acquisition and development of Indonesia's future surveillance and security systems must deal with these threats, and at the same time be realistic in terms of affordability.

CHAPTER V

THE SURVEILLANCE DEVELOPMENT PROGRAM

Economic Considerations. Indonesia's economy is undergoing a period of considerable difficulty and stress. During the past three years Indonesia has experienced pressures on its cash flow position as the result of a sharp increase in her budgetary and spending requirements at the very time revenues have gone into a temporary, but abrupt decline. Indonesia's foreign debt repayment obligations have risen concurrent with a 25% drop in oil prices. This has placed Indonesia's economy under pressure and has strained its short term resources. This condition is expected to continue over the near term, hopefully it is only a temporary set back which sound management and determination will successfully overcome.

Other considerations which will affect the development of new capabilities and systems are: technology, sociopolitical development, and defense-security issues. These considerations will not be discussed in more detail at this specific juncture, but they will influence the of obligations of the DOD and Armed Forces HQ in shaping their planning and programming process.

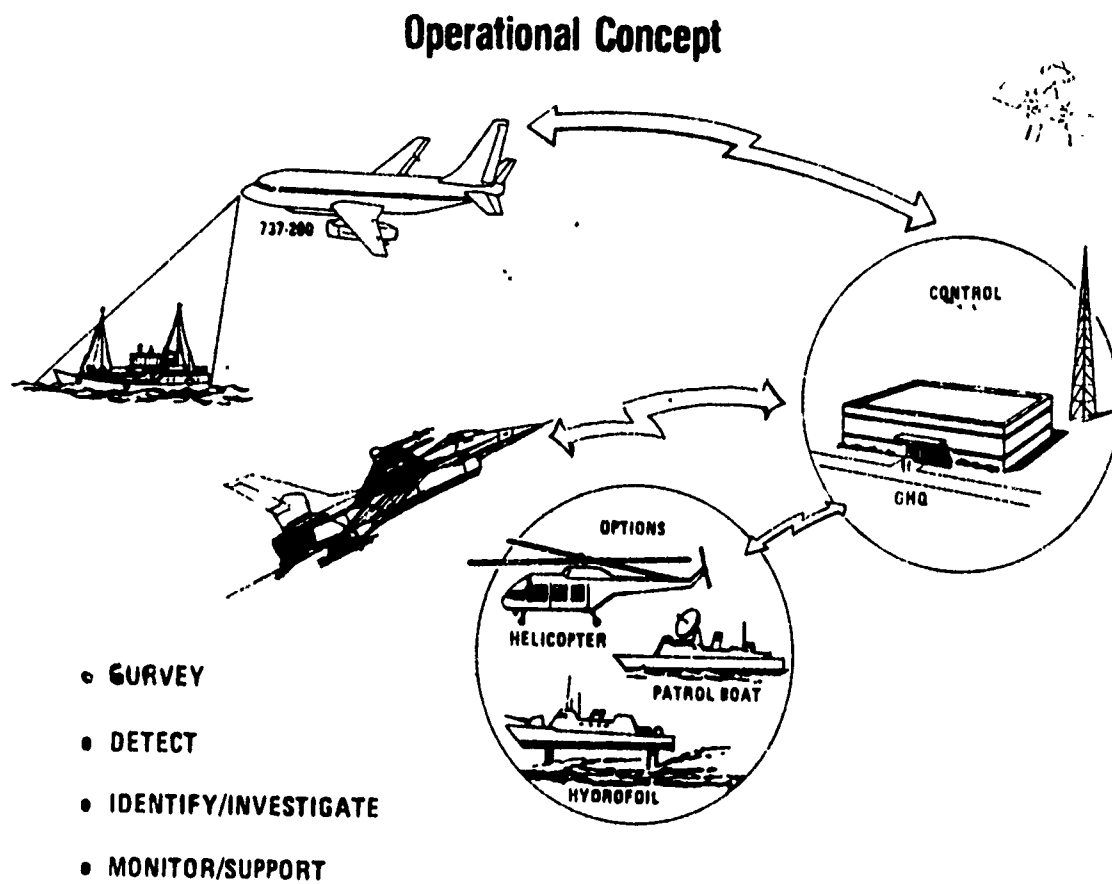
Programming Considerations. Based on the above, the surveillance system development program can be broken down into a

more detailed Defense Military Estimate. The major program elements considered in the estimate are:

- a. Defense spending and budget
- b. The system's software and hardware
- c. The employment strategy

The software is the most crucial and fundamental element. It will be a major challenge to define and program a replacement for the present surveillance system (Figure 4) while still meeting budget constraints and technology requirements. Management Information Systems (MIS), which are key to interoperability and command and control, should be developed and considered as first priority items. The joint surveillance system capability desired by the Armed Forces can be achieved by exploiting the capabilities of the PALAPA B II COMSAT. The Management Information Systems, which is a main part of the system, and provides interoperable command and control, should be built up first. The advantages and privileges from the PALAPA B II COMSAT make the Joint Surveillance System desired by the ARMFOR feasible.

Figure 4



From a military standpoint the MIS data base can be stored anywhere it is operability feasible. The infrastructure and level of Indonesia's communication industry, coupled with available assistance programs, offer a good prospect for relatively advanced technology in the system design. This is an economically feasible solution.

The system will be interlinked and synchronized with the Section Operation Center (SDC), Region Operation Center (ROC) of the Air Defense Command, and the Joint Operation Center (RDA - Ruang Yudha ABRI), which is the focal point of the Indonesian Armed Forces National Security and Decision Making System. The communication and data exchange should have a high level of survivability and interoperability via an integral digital air/ground communication system. It will probably take about one year to complete the Preliminary Process, and then go to the Review and Update of the system design. A second year will be required for fundamental hardware development, including Procurement, and the Assembly process will take another one or two years to accomplish (Figure 5).

Figure 5

INDONESIAN AIR MARITIME SURVEILLANCE

AND

SECURITY SYSTEM

PROGRAM PROPOSED SCHEDULE

| | 1st y | 2nd y | 3rd y | 4th y | 5th y |
|--------------------------|------------------------|-------------------|-----------------|--------|-------|
| SYSTEM DESIGN & DOC | PRELIM | REVIEW AND UPDATE | FINAL | | |
| FUNDAMENTAL EQUIPMENT | PROCUREMENT & ASSEMBLY | TEST | | | |
| J O C - RUANG YUDHA C3 | PROCUREMENT & ASSEMBLY | TEST | | | |
| SOC C3 | PROCUREMENT & ASSEMBLY | TEST | | | |
| ROC C3 | PROCUREMENT & ASSEMBLY | TEST | | | |
| INTEGRATION TEST | | | | | |
| HARDWARE | | PROC & ASSEMBLY | TEST | | |
| AIRCRAFT | | PROC & ASSEMBLY | TEST | | |
| HOOVERCRAFT / FAST BOAT | | | PROC & ASSEMBLY | TEST | |
| INTEROPERABILITY TEST | | | | | |
| A S E A N SYST DES & DOC | | | | PRELIM | |
| FOLLOW ON PROG | | | | | |

Planning Considerations. Plans for developing a future surveillance program must take into account the economic consideration of national power in addition to alternative levels of capability and performance. Although Indonesia, or even the ASEAN as a whole, can not afford to develop expensive system such as the \$4 billion Global Positioning System (GPS), there are affordable alternatives that will provide a capability to enforce national sovereignty. Development must also balance regional interests and address the political and military trends discussed in chapter II and III.

System's Hardware Considerations. There are many options of hardware suitable and available for Indonesia to develop a Surveillance and Security System. They are reliable, sustainable, and have modern technology, but there are some problems that will arise, especially concerning the ARMFOR's budget and development program.

1. Space Based System. Surveillance satellites would be the most effective system for a specific area in the Indonesia or ASEAN region. The sensors or optical system are orbited at altitudes of 250 to 500 km. The systems utilize photographic films, or charge coupled devices which record the optical image in digital forms. Several images are taken simultaneously

covering a broad spectrum. The data package thus collected is encrypted for transmission. This can be directly commanded by the ground station (RDA/ADC) or sent automatically once the satellite is in a favourable orbital position in relation to a ground station or relay satellite.

Upon reception, the data is processed by the main computer and can be retrieved. The analysts are then able to obtain analog format images and data concerning particular geographical areas on a specific date and at a precise time.

Unfortunately, according to a space expert source, to obtain near full time coverage requires a large constellation of satellites: up to twenty. These would cost between \$500,000,000 to \$1,000,000,000 US each. (4:240)

2. Over The Horizon (OTH) Radar. The system is relatively well known in its long range version using high frequency wave propagation. It bounces signals off the ionosphere in order to detect ships and aircraft at ranges between 1,000 and 3,000 km. Some of the radio energy is scattered back from the target and returns to the radar receiver, again via the ionosphere. The signals that are reflected back to the receiver from targets are normally well below the background noise level, and can be detected only because the transmitted pulses are coherent, extremely stable in both frequency and phase, and have Doppler frequency shift due to target motion. If the returns from the

successive pulses are integrated over a period of time, the background radio noise and sea clutter will be largely removed by Doppler velocity filtering from the integration process, leaving the target returns visible above the residual noise. (5:501)

Although it has limitations, surface wave HF radar has now been shown to be capable of providing reliable and effective early warning coverage of a given coastal area at what Marconi claims to be something like ten percent of the cost of an airborne system based on AWACS. In Australia the experimental Jindalee system has been working successfully for some time. This major program is estimated to cost some A\$500,000,000 for three stations. (5:502) Thus, Indonesia will need about nine stations at an estimated cost of A\$1,500,000,000 to cover the proposed area.

3. Shipborne Radar. Shipborne OTH surface wave radars are attracting renewed attention. Their ability to provide early warning and their potential effectiveness against targets using stealth techniques is good. At frequencies below about 200MHz typical target dimensions approximate to one wavelength, and can set up a resonance effect that allows the target to be detected at extended ranges. A comparatively inexpensive system can be provided by coupling specialised processing with standard HF communications equipment. Marconi radar systems

has carried out several trial programs on land and at sea, and the UK's Admiralty Research Establishment has tested such a system aboard the fleet auxiliary, Grey Rover. The research is also examining bistatic operation, with multiplexed data being transmitted between ships or exchanged with a shore station, to increase platform survivability and to overcome problems of target disappearing when they are on a radial flightpath and hence produce no Doppler shift. Ranges of 100 km have been achieved, but not with sufficient accuracy for targetting. (6:667)

For a relatively modest Indonesian Navy, tens of new ships plus the radars would have to be built to cover the entire region. This system would be more effective as a gap filler for the entire surveillance system.

4. E-2C AEW Aircraft. The E-2 Hawkeye was developed as a carrier-borne early warning aircraft, but is suitable also for land based operations. The Hawkeye can maintain patrol on a naval task force defense perimeters in all weather, at an operating height of about 30,000 ft, and can detect and assess any threat from approaching enemy aircraft over ranges approaching 260 nm. An AN/APS-139 radar system superseded the earlier AN/APS-125 and AN/APS-138 in new production E-2Cs in 1988. A retrofit programme is in progress for all previously delivered aircraft. The system includes a new total radiation aperture

control antenna (TRAC-A) to reduce side lobes and offset increased jamming threats. The radar is capable of detecting airborne targets anywhere in a three million cubic miles surveillance envelope while simultaneously monitoring maritime traffic. Long range detection, automatic target track initiation and high-speed processing combine to enable each E-2C to track, automatically and simultaneously, more than 2000 targets and to control more than 10 airborne intercepts.

A Randtron Systems AN APA-171 antenna system is housed in a 24 ft diameter saucer shaped rotodome, mounted above the rear fuselage of the aircraft, which revolves in flight at 6 rpm. The Yagi type radar arrays within the rotordome are interfaced to the onboard avionic systems, providing radar sum and difference signal plus IFF.

The AN APS-139 search radar can detect targets as small as a cruise missiles at ranges in excess of 145 nm. It can also monitor movement of enemy ships and land vehicles. The AN ALR-73 passive detection system alerts operators to the presence of electronic emitters at distances up to twice the detection range of the radar system, thus expanding significantly the surveillance capability of the E-2C

The Royal Singapore Air Force built a full system for about US \$500 million, and the estimate price for one of their four E-2C is about US \$50 million.

Appendix B provides details on the E-2C Hawkeye. (7:894)

5. Aerostatt Balloon. Generally speaking, these vehicles can carry many different surveillance instruments and are relatively very cheap. But this system is very vulnerable to the weather conditions, especially the tropical rainstorms that are frequent in Indonesia. It is therefore not considered further.

6. The Global Positioning System (GPS). An effective surveillance and security system must be based on plans that take into account the important factors of timing, coordination and a precise knowledge of terrain. The Global Positioning System would enhance the planners ability to exploit these principles. The GPS will have a significant impact on the conduct of surveillance and security operations, including the deployment of weapon systems. But how the GPS will contribute to system design depends on the planner's knowledge of the system.

The potential GPS users include existing military and civil ground, sea and air host vehicles, and space platforms, as well as new generations of users equipped with GPS receiver sets. As a result, a worldwide user community is expected, presumably including ASEAN, that will be affected by the availability and application of this technology.

The NAVSTAR GPS is a space-based radio positioning navigation and time transfer system that operates on two

L-band frequencies: 1575.42 MHz (L1) and 1227.6 MHz (L2). The GPS is comprised of three major segments: a space segment, a control segment, and a user segment.

There are many benefits the ARMFOR can get from the applications of the GPS for both military and civil operations. The system can pick up a precise three dimensional position relative to friendly and hostile activities based on the World Geodetic System 1984, on which the data can be standardized. The UE set then will convert the WGS into other datums when operating with other maps and data products. More complete information on GPS is in Appendix A. (B:1)

Summary. Despite their vulnerability to homing missiles and jamming, radar systems will remain the prime source of detection and control, for application in surveillance system. A Spaceborne Surveillance System is costly, and in the military sphere they are dedicated for strategic surveillance. Consequently information about these systems and their nature is extremely limited. However, Indonesia or the ASEAN might receive information from US resources concerning hostile threats if their sovereignty is at stake.

For very long range detection the backscatter type of OTH radar would be the answer, but they present somewhat of a problem in forecasting their future use in Indonesia's Surveillance System. Although they provide detection out to very long

ranges, the cost in time and development, installation and maintenance is extremely high.

Although a great deal of emphasis is placed upon air surveillance, it must not be forgotten that surface search radar plays an important part in overall surveillance, especially in the defence aspect. The greatest problem in surface surveillance is the range of the system which is largely limited by the height that the antenna can be mounted on the ship, and the weight/size of the antenna itself. In Indonesian's situation, it is not the right time to build such an armada for this specific purposes of surveillance.

Also the aerostatt balloon will not provide suitable results.

Finally, the E-2C is most likely to be the best answer for Indonesian surveillance system. The reasons are:

1. The aircraft is the least expensive compare with the other hardware.
2. Based on its avionics performance (Apendix B), it is the most effective vehicle for the time being.
3. The US Navy is going to reduce its budget, presumably including its aircraft, and hopefully the US government would make sales of any E-2C available to Indonesia.
4. Indonesia will need two aircarcraft, and then the rest of the entire system can be done by IPTN (Indonesian Aircraft

Factory), under the US avionics producers supervision and licence. The avionics can also be attached to the Cassa 235.

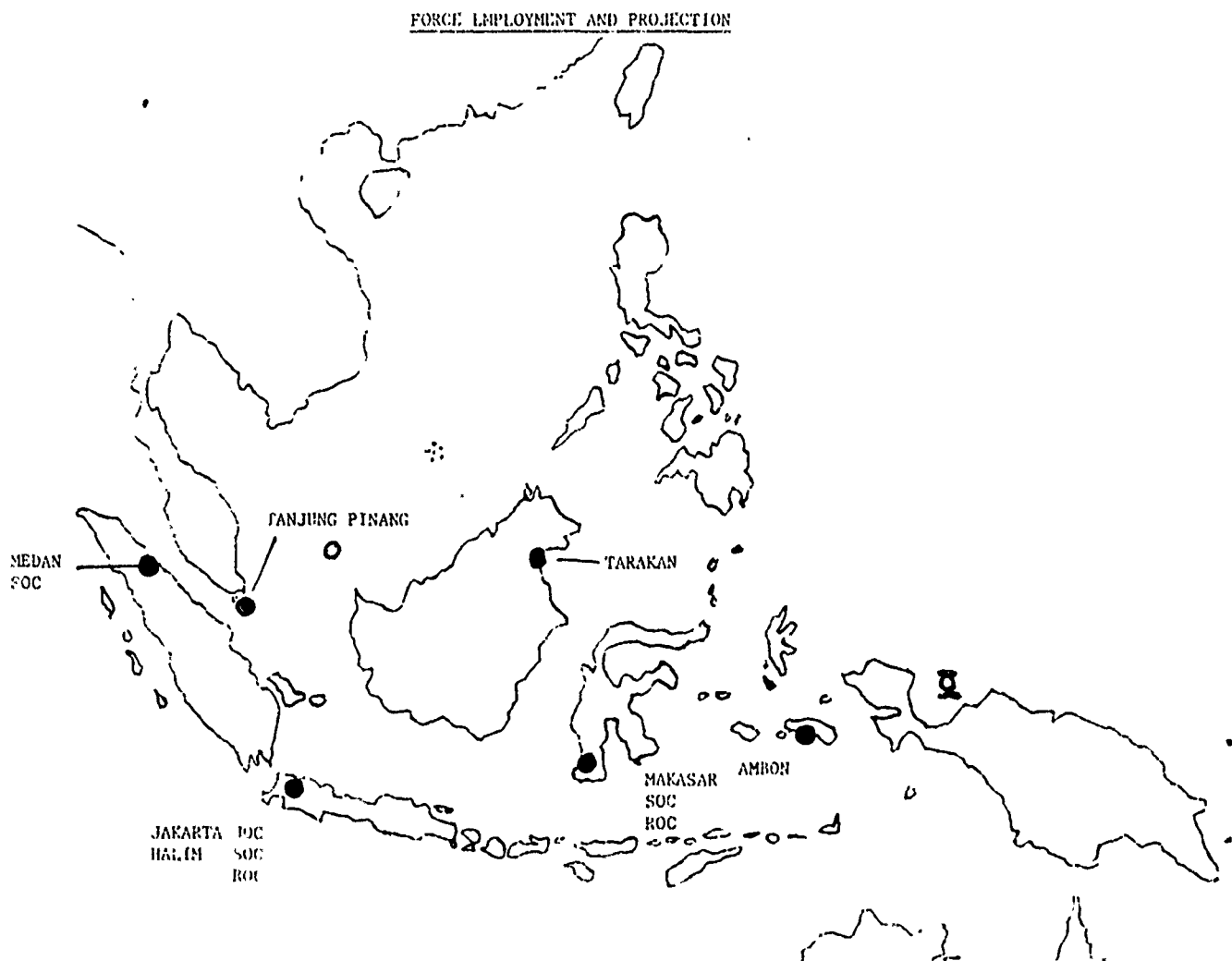
5. The system would not only be used for surveillance purposes, but could be integrated as a defence system under the ADF.

Force Structure and Employment. Indonesia would deploy the system's forces in those areas where border violation and smuggling have happened frequently. These are by priority the Mallaca straits, the Sunda straits, the Makasar and Lombok or Sumba straits, and the Banda Sea.

The basing system would be organized and synchronized as part of AFOCOM's strategic basing plan. During peacetime the force will operate under the Territorial Command in coordination with the Naval Fleet Command. Basing under a higher intensity conflict management system is looked at in Figure 6.

Figure 6

- First Priority
- Second Priority
- Third Priority



CHAPTER VI

CONCLUSION AND RECOMMENDATION

CONCLUSION

The security of the sea-lanes in ASEAN waters is of utmost importance to Indonesia and many other nations whose economic well being depend on trade and the supply of energy and other materials transported by sea.

The majority of world coastal and archipelago states have established 200-mile Exclusive Economic Zones to protect and control their fishery, mineral, petroleum, and other resources. This makes the actual enforcement of national sovereignty over their respective EEZ a major problem area. It also raises potential problems from conflicting claims between adjacent states such as between ASEAN countries and Australia, Vietnam, and China.

The danger of oil spillage or collision caused by sea borne traffic through the narrow passage choke points of SLOCs in Southeast Asia present a relatively low military security risk to the region. An improve Surveillance and Security system can further reduce any risk.

However, the Soviet military buildup and her political

influence since the departure the US from Vietnam, put political and economic responsibility on the members of ASEAN. The Soviet Union's strategic conception of international communism with Vietnam as a proxy will be a greater threat to the region's stability in the coming years, even though East-West tension has diminished.

From the Indonesian perspective, the countries of the region should increase their efforts to respond to hostile communist activities such as territorial sea and border violations.

At present, Indonesia's Air Maritime Surveillance and Security System is unable to meet national requirements. The system should be upgraded quickly with the software receiving priority as the element that provides interlink and interoperability. Use of the E-2C Hawkeye and the GPS would enhance Indonesian capabilities and benefit ASEAN as well.

It would be in the interest of the US government to provide assistance to Indonesia and ASEAN in developing a capability to provide security in the critical Southeast Asia region.

RECOMMENDATION

An Indonesian Surveillance and Security System, as an integral part of the National Strategy and Development Program,

should be moved to first priority to enhance the security and prosperity of Indonesia and other regional nations.

The E-2C Hawkeye is the most effective and the least expensive hardware, even compared with Boeing 737 modification and retrofit. The GPS is the another reliable and affordable instrument system compared with the ARMFOR's present Surveillance and Security System.

Should the US move out of the Philippines bases, then Indonesia should increase its effort to acquire a new Surveillance and Security based on her regional leadership perspective and for the benefit of ASEAN.

The US Government should help ASEAN in this respect because most of the ASEAN countries are economically "weak" and could not afford to develop the required systems, especially the advance technology such as the space based and OTH radar systems.

APPENDIX A

THE NAVSTAR GLOBAL POSITIONING SYSTEM

In the coming years there will be available space systems which will provide global coverage with position determination from such satellite-based systems as The US Global Positioning System (GPS), the Soviet Global Navigation Satellite System (GLONASS), and the European Space Agency NAVSAT . The Soviet GLONASS, considered a virtual replica of US's GPS, is expected to be fully compatible and incorporable. Europeans are proposing a refined version of the NAVSAT satellite-based navigation network as a system that initially would supplement services provided by GPS and GLONASS.

a. The Space Segment. The GPS Space Segment, when fully operational, will be composed of 24 satellites (including three operational spares) in six orbital planes. The satellites will operate in circular 20,200 kilometers (10,900 NM) orbits at an inclination angle of 55 degrees with a 12 hour period. The precise spacing of satellites in orbit will be arranged such that a minimum of four satellites will be in view of any user, thereby ensuring world wide coverage. Each satellite is designed to transmit an L1 and L2 signal. L1 carries a precise (P) signal and a coarse/acquisition (C/A) signal, while L2 car-

ries the P code only. Superimposed on this signal will be navigation and data including satellite ephemeris, atmospheric propagation correction data and satellite bias information.

b. The Control Segment. The Control Segment includes a number of monitor stations and ground antennas located throughout the world. The monitor stations use a GPS receiver to passively track all satellites in view and thus to accumulate ranging data from the satellite signals. The information from the monitor stations is processed at the Master Control Station (MCS) to determine satellite orbit and to update the navigation message of each satellite. This updated information is transmitted to the satellites via ground antennas.

c. The User Segment. The user segment consist of User Equipment (UE) sets and associated support equipment. UE sets, utilizing data transmitted by the satellites, derive navigation and time information for local use. The application of the GPS UE in various types of host vehicles, used under wide variety of operational conditions has led to the development of three types of the UE Sets: Low Dynamic (one channel); Medium Dynamic (two channel); and High Dynamic (five channel).

The five channel set continuously tracks and monitors four satellites simultaneously and is normally used in a vehicle operating in a high dynamic and or high jamming environment, or in a vehicle where fast acquisition of GPS signals is required.

The fifth channel is used to improve UE set performance such as in a jamming environment.

Where operational conditions such as vehicle dynamics, operating time constraints, and jamming levels are less stringent, the one or two channel set may be used. The one channel set tracks and monitors four satellites sequentially.

In the two channel set, one channel sequentially tracks four satellites while the second channel performs background functions including the search for a rising satellite. Four satellites are normally required for navigation purposes to establish a three dimensional position determination and to estimate the user's clock error

Applications. In air and naval military operations some of the application of the technology are:

- a. Precision Survey
- b. Photo Reconnaissance
- c. Target Acquisition
- d. Rendezvous
- e. Search And Rescue
- f. Low Level Navigation
- g. Coordinate Bombing
- f. All Weather Air Drop
- g. Command And Control
- h. Other Military Uses.

The list above summarizes the military applications which could enhance a maritime surveillance and security system need by Indonesia in the coming years.

APENDIX B

THE E-2C HAWKEYE

Type: Airborne early warning aircraft.

Accommodation: Normal crew of five on flight deck and in ATDS compartment in main cabin, consisting of pilot, co-pilot, combat information center officer, air control officer and radar operator.

Avionics: Randtron AN APA-171 rotodome (radar and IFF antennae). General Electric AN APS-139 advanced radar processing system (ARPS) with overland overwater detection capability (with APS-145 scheduled for introduction in 1991 and eventual retrofit in all E-2C). RT-988 A IFF interrogator with Hazeltine DL-76 AP IFF detector processor. Litton AN ALR-73 passive detection system. Hazeltine AN APA-172 control indicator group. Litton DL-77 ASQ computer programmer (L-304). ARC-158 UHF data link. ARQ-34 HF data link. ASM-440 in flight performance monitor. Collins ARC-51A UHF com. AIC-14A intercom. Litton AN ASN-92 (LN-15C) CAINS carrier aircraft inertial navigation system. GEC avionics standard central air data computer. APN-153 Doppler. ASN-50 heading and attitude reference system. ARN-52(V) Tacan. Collins ARA-50 UHF ADF.

ASW-25B ACLS and Honeywell APN-171(V) radar altimeter.

Performance: (at max T.O. weight)

| | |
|----------------------------------|-----------|
| Max level speed | 323 knots |
| Max cruising speed | 311 knots |
| Cruising speed | 268 knots |
| Approach speed | 103 knots |
| Stalling speed | 74 knots |
| Service ceiling | 30,800 ft |
| Min. T-O run | 2,000 ft |
| T-O to 50 ft | 2,600 ft |
| Min Ldg run | 1,440 ft |
| Ferry range | 1,394 nm |
| Time on station 175 nm from base | 3-4 h |
| Max endurance | 6h 6min |

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